pH calculations

1) Calculate the concentration of the methanoic acid solution with a pH of 2.78.

pK_a (HCOOH) = 3.74

2) Calculate the pH of 0.150 mol L^{-1} aqueous ammonia, NH_3.

pKa (NH_4^+) = 9.24

3) A solution prepared by dissolving hydrogen fluoride in water has a pH of 2.34. Calculate the concentration of the hydrogen fluoride in the solution.

pKa (HF) = 3.17

4) Calculate the concentration of the NH_4Cl solution.

pKa(NH_4^+) = 9.24 Ka = 5.75×10^{-10}

5) Calculate the pH of a 0.0500 mol L^{-1} ethanoic acid solution. pKa (CH_3COOH) = 4.76 Ka = 1.74×10^{-5}

6) A solution prepared by dissolving sodium methanoate in water has a pH of 8.65. Determine the concentration of methanoate ions in the solution.

7) Write the *K*a expression for hypobromous acid. Calculate the pH of a 0.0525 mol L^{-1} hypobromous acid solution.

p*K*a(HOBr) = 8.62

8) The pH of the solution in the stomach of a patient in hospital is 2.50. As a treatment, the patient is given a small volume of sodium citrate (Na_3Cit) solution. Citric acid, H_3Cit, is a triprotic acid.
i) Would the pH of a solution of sodium citrate be less than, equal to or greater than 7?
A calculation is not required.

ii) Explain your choice, including an appropriate equation in your answer.

9) Calculate the concentration of ethanoate ions (CH_3COO^-) in a buffer solution of pH 5.00 if the concentration of CH_3COOH in the buffer is 0.0500 mol L^{-1}.

*K*a (CH_3COOH) = 1.76×10^{-5} at 25°C

10) An industrial process produces an effluent that is an ammonium chloride solution with pH = 4.96.

pK_a: NH_4^+ = 9.25

i) What is the concentration of the ammonium chloride solution?

ii) If the effluent has to be at pH = 7.00 before it can be discharged from the site, what mass of ammonia (g) must be dissolved in 1000 L of effluent?